



UNITED STATES PATENT AND TRADEMARK OFFICE

265
UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/034,288	12/21/2001	Ivan Bachelder	C01-017	9753
23459	7590	11/17/2004	EXAMINER	
ARTHUR J. O'DEA LEGAL DEPARTMENT COGNEX CORPORATION ONE VISION DRIVE NATICK, MA 01760-2077				SETH, MANAV
ART UNIT		PAPER NUMBER		
		2625		
DATE MAILED: 11/17/2004				

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/034,288	BACHELDER, IVAN
Examiner	Art Unit	
Manav Seth	2625	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) Responsive to communication(s) filed on 12/21/2001.

2a) This action is **FINAL**. 2b) This action is non-final.

3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) Claim(s) 1-16 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) Claim(s) _____ is/are allowed.

6) Claim(s) 1-16 is/are rejected.

7) Claim(s) _____ is/are objected to.

8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) The specification is objected to by the Examiner.

10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) All b) Some * c) None of:
1. Certified copies of the priority documents have been received.
2. Certified copies of the priority documents have been received in Application No. _____.
3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) Notice of References Cited (PTO-892) 4) Interview Summary (PTO-413)
2) Notice of Draftsperson's Patent Drawing Review (PTO-948) Paper No(s)/Mail Date. ____.
3) Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 06/26/2002.
5) Notice of Informal Patent Application (PTO-152)
6) Other: ____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claim 1, 2 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hannan, U.S. Patent No. 4,404,594 and further in view of Frost et al, U.S. Patent No. 5,647,025.

- Claim 1 recites “ a method for generating a focused image of an object comprising: acquiring an image of an object, the image having at least one region”. Hannan discloses of obtaining an image sample from each of a plurality of portions of the images in lines 25–30 of column 2.
- Claim 1 further recites “performing a fine feature sharpness measurement on the at least one region of the image to provide a sharpness score”. Hannan discloses of performing fine feature measurement to determine a sharp focus in lines 1 - 12 of column 3.
- Claim 1 further recites “computing a composite image using the at least one region of the image and spatial weighting”. Hannan discloses

obtaining a composite image by combining each of the optimally focused image portions in lines 1- 4 of column 4.

- Claim 1 further recites "determining a spatial weighting using the sharpness score". Hannan does not teach of determining a spatial weighting using the sharpness score.

Frost discloses determining the spatial weighting using sharpness, score of each portion in lines 50-60 of column 8

While Hannan does determine the sharp focus for the individual image portions (col.3, lines 1-12), the reference does not disclose the claimed specifics of determining spatial weighting as part of the focus determination. However, Frost determines a sharpness score and uses the sharpness score to determine the spatial weighting. Therefore, it would have been obvious to one having the ordinary skill in the art at the time of the invention was made, to combine the invention of Hannan with that of Frost. One would have been motivated to add to the invention of Hannan the steps of determining a sharpness measure and then calculating the spatial weighting using the sharpness score from Frost because both references are directed to the determination of focus of an image and Frost provides a process to bring into best focus only the objects of interest without the need to focus independently on each object of interest (column 2, lines 11 – 14). Further, the process of Frost will allow for a way to measure the focus when objects of interest are at

different focal lengths from the image detector (see lines 1-5 of column 2 in Frost, for example).

- Claim 2 recites "the method of claim 1 wherein the focus feature sharpness measurement is performed on each of a plurality of regions, each such region corresponding to a location on the object". Claim 2 has been analyzed and is rejected as per claim 1 and in further consideration to Hannan (column 2, lines 17-30).
- Claim 5 recites " the method of claim 1 wherein the fine feature sharpness measurement further comprises: transforming the at least one region of the image so as to provide a plurality of spatial frequencies of the at least one region of the image; measuring a density of high spatial frequencies; and using the density of high spatial frequencies so as to provide a fine feature sharpness measurement". Hannan discloses using of high pass filter for blocking low-frequency portion of the image portion output and passing the high-frequency portions which represents the high spatial frequency detail necessary for sharp focus (fine feature sharpness measurement (Column 2, lines 1-12). It is clear from Hannan that an image comprises of both low spatial frequency and high spatial frequency details and such a frequency distribution of an image is an inherent property of an image and high frequency data represents edge and details of an image.

3. Claims 3 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hannan, U.S. Patent No. 4,404,594 and further in view of Frost et al, U.S. Patent No. 5,647,025 and further in view of Toriumi et al, U.S. Patent No. 4,616,262.

- Claim 3 recites " the method of claim 1 wherein the step of computing a composite image comprises a weighted average using the at least one region of the image and the spatial weighting". Hannan in combination with Frost discloses of computing a composite image using at least one region of the image and the spatial weighting as analyzed in rejection for claims 1 and 2 but are silent to the specific process of computing a composite image by determining a weighted average using the at least one region of the image and the spatial weighting.

However, Toriumi discloses determining of spatial weighting for the images to be combined (column 5, lines 39-45), and further combining the images by performing density conversion (weighted average) using the image information (spatial weighting score) in figures 6 and 11 and lines 48-51 of column 4. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention was made, to combine the combined invention of Hannan and Frost as discussed earlier with that of Toriumi. One would have been motivated to add to the combined invention of Hannan and Frost the step of computing the composite image by computing a weighted average using the spatial weighting score from

Toriumi because the combined invention of Hannan and Frost and the invention of Triumi are directed to the generation of composite image and Toriumi provides the specifics of generating composite image by implementing the weighted average using the spatial weights of the images to be combined. Further, the process of Toriumi will further provide a way to correct the pixel density at the interface of the combined images and provide for a smoother transition at the interface of the images to be combined.

- Claim 4 recites “the method of claim 3 wherein the weighted average is an incremental weighted average”. Weighted average has been analyzed in the rejection of claim 3 and same analysis with additional argument as disclosed below, are applied to the rejection of claim 4. Toriumi discloses the incremental weighted average used at the interface to combine the images in figures 23 and 25 and in lines 43-50 of column 6.

4. Claims 8, 9, 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Frost et al, U.S. Patent No. 5,647,025 and in further view of Kubota et al, IEEE Publication, 2000, “Inverse filters for reconstruction of arbitrarily focused images from two differently focused images”.

- Regarding claims 8, 9, 10 and 11, Frost fails to disclose the use of fuzzy transition such as Gaussian. However, in the same field of the invention, Kubota discloses that when at least one region (foreground) overlaps

another adjacent region (background) the overlapping results in blurring (fuzziness) which is a Gaussian function (in the left column of page 2). Further, applicant has admitted in the specification (page 18, line 1- 6) that this is well known in the art of image processing field. Therefore, it would have been obvious that one would have been motivated to incorporate the teaching of Kubota into the method of Frost for the purpose of generating an all-focused image in which both adjacent images are in focus because of the conventionality of this type of transition and because this will make the adjacent image portions to blend together and not be distracting to the viewer and, additionally, because the applicant has acknowledged that this is a well known procedure (page 18 of the specification).

5. Claims 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Frost et al, U.S. Patent No. 5,647,025 and in further view of Palmquist et al., U.S. Patent No. 5,179,419.

- Claim 15 recites "the method of claim 7 wherein the object is a fiber optic cable end face". Frost does not teach of generating a focused image of a fiber optic cable end face. However, Palmquist discloses the methods of detecting defects in optical fiber end faces. Palmquist same as Frost is also directed to the determination of optimum focal position (column 3, lines 30-40) by acquiring a plurality of images (column 6, lines 42-45) and performing a sharpness measurement (column 6, lines 62-65) on each of

the image portions whereas the image portion belongs to a fiber optic cable end face. Palmquist same as Frost determines the coarse focus position and comprises of grayscale image map for each image (column 8, lines 1-4). Therefore, it would have been obvious that one skilled in the art would have been motivated to use the Frost's method of generating a focused image of a fiber optic cable end face because both the references discloses the focus measurement at micro-image level.

- Claim 16 recites "the method of claim 15 wherein the set of regions are annular". Frost discloses a spiral pattern formation around the original starting focus point when determining a set of focus regions on the surface of the object.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 6, 7, 12, 13 and 14 are rejected under 35 U.S.C. 102(b) as being anticipated by Frost et al, U.S. Patent No. 5,647,025.

- Claim 6 recites “providing a plurality of images of the object, each image having a focus setting”. Frost discloses a focus measurement for each of the images and where each focus measurement is a function of at least one image measurement (column 2, lines 26-31).
- Claim 6 recites “providing at least one image region in at least one image”. Frost discloses of dividing each **field of view** into smaller portions (column 7, lines 40 – 46) and figures 2A and 2B.
- Claim 6 recites “measuring sharpness score of a portion of the at least one image corresponding to the at least one image region”. Frost discloses determining the sharpness for each of the smaller portions of the **field of view** (column 8, lines 30 – 42).
- Claim 6 recites “determining a spatial weighting for the portion of the at least one image using the sharpness score”. Frost discloses of assigning spatial weights to each portion using the sharpness score (column 8, lines 50 - 59).
- Claim 6 recites “generating a focused image using the portion of the at least one image and the spatial weighting”. Frost discloses of generating a best-focused image using the spatial weighting (column 8, lines 60 - 67) and (column 9, lines 1 - 2).
- Claim 7 recites “ the method of claim 6 wherein the step of providing at least one image region in at least one image further comprises: determining a set of focus regions on the surface of the object; and

aligning at least one focus region in at least one image". Frost discloses of identifying objects of interest from a set of images collected from different focal lengths, which satisfy the limitation "determining a set of focus regions on the surface of the object" (column 2, lines 1-3). Frost in continuation also disclose "a method to bring into best focus only the objects of interest in a full field of view" (column 2, lines 11-14) and " a focus measure is computed for each of the images, where each focus measure is a function of at least one image measurement" (column 2, lines 26-29) which satisfy the limitation "aligning at least one focus region in at least one image".

- Claim 12 recites "the method of claim 6 wherein the at least one image region comprises a greyscale image map". Frost discloses "a histogram is computed of the gray levels of the image" (column 7, lines 21-23 and lines 46-50).
- Claim 13 recites " the method of claim 6 wherein the step of providing a plurality of images further comprises: determining a coarse focus position". Frost discloses of computing an initial focus scan to determine the best focus (coarse focus) position and this process continues incrementally until a best focus position is achieved (column 9, lines 1-10 and lines 20-27). Each time the initial focus scan is performed a plurality of images are acquired (column 6, lines 11 – 14 and lines 65 - 66).
- Claim 14 has been analyzed and is rejected as per claim 13.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- Bose et al, U.S. Patent No. 5,040,228 discloses a method and apparatus for automatically focusing an image-acquisition device.
- Stern et al, U.S. Patent No. 6,603,874 discloses a system and method for simultaneously obtaining a plurality of images of an object from a plurality of different viewpoints.
- Yamaguchi, U.S. Patent. No. 5,511,155 discloses a method and apparatus for forming a synthesized optical image with all of the desired objects in focus.

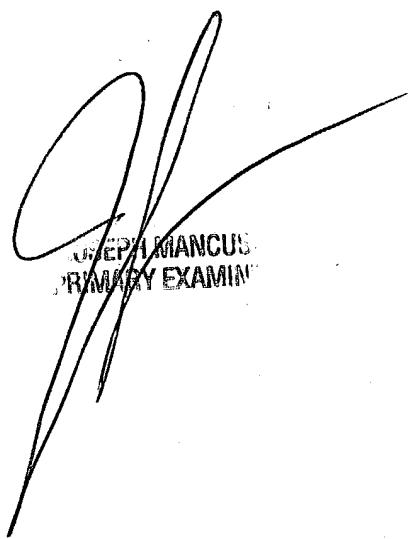
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Manav Seth whose telephone number is (703) 306-4117. The examiner can normally be reached on Monday to Friday from 8:30 am to 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph Mancuso, can be reached on (703) 305-3885. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for

published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free)

Manav Seth
Art Unit 2625
November 12, 2004



JOSEPH MANCUS
PRIMARY EXAMINER